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(54) Title: ELECTRIC CONDUCTORS

(57) Abstract: Electric wires are described consisting of a metallic wire able to conduct the electric current, the outer surface of which is coated in an alloy consisting of specific metals in set quantities.

Field of the invention

The present invention refers to the field of electric wires.

State of the art

The transmission of small and variable electric signals, like audio signals for example, is proving to be a much more complex phenomenon than known to the state of the art since in transmission of the electric signals, phenomena occur that are audible to the listener although they cannot be identified instrumentally, such as timbre, spatiality and harshness of the sound.

The distortion in high frequency or packing in medium audio frequency, caused by the copper used for the production of traditional electric wires, is audible and is immediately perceived by the silver wiring.

To overcome the above problem, the patent US 6,399,885 describes cables consisting of a number of wires, positioned in series or in parallel, each one made of a different metal (in particular gold, copper or silver), said wires being insulated from each other and wrapped in a dielectric sheath.

Despite the validity of these wires they are obviously difficult to implement at industrial level given the necessary presence of gold and the manufacturing problems they entail.

Another solution consists in the application of filters or compensating networks in order to compensate for the various timbres or distortions produced by the metals of the components and wiring. The results are not completely satisfactory, however, and distortions remain which cannot be eliminated and which are perceived by the listener.

Hence the importance of eliminating the above negative factors associated with pure metals in view of the fact that the use of silver alone produces a very clear non-distorted sound but is rather faint and decidedly too metallic.

Summary of the invention

It has surprisingly been found that it is possible to solve the problem in an entirely satisfactory manner by means of metal wires, on the surface of which an alloy is deposited consisting of appropriate metals in set percentages.

Furthermore, it has been found that the wires as described and claimed in the present application not only perfectly solve the above-mentioned problem but also permit other applications in which the purity of transmission of the electric signal is essential for obtaining excellent final performance.

Detailed description of the invention

The wires according to the invention consist of a normal metal wire able to conduct the current, for example a copper wire, the outer surface of which is covered in an alloy containing tin, antimony and copper.

Preferably the various metals constituting the alloy are present in the following concentrations:

Tin	from	74%	to	98.9%
Antimony	from	1%	to	10%
Copper	from	0.1%	to	25%

More preferably the alloy according to the invention consists of Tin 95%, Antimony 4%, Copper 1%.

Normally the qualities of the wire increase as the thickness of the alloy layer increases.

To obtain a wire according to the invention, the metallic wire is dipped in a bath consisting of the molten alloy. Obviously the time the wire is left in the bath will depend on the temperature of the bath, the type of metal constituting the wire and its dimensions in order to permit deposit of the alloy on the wire without the latter melting or being damaged by immersion for too long at an excessively high temperature.

If, for example, the wire is 0.40 mm in diameter, a bath with temperature between 300°C and 450°C is used, and the wire immersion time is approximately three seconds.

Before being dipped in the molten alloy bath, the metallic wire is preferably passed through a flux, of the type normally used in the welding of electrical material or in the manufacturing of electric circuits, for example rosin, and then left to dry; the flux improves adhesion of the molten alloy to the wire.

If preferred, before immersion in the alloy bath, the wire is pre-heated, for example to a temperature between 60° and 90°C.

Examples of production of wires according to the invention are given below.

Example 1

A copper wire, diameter 0.40 mm, is passed through rosin and left to dry; the wire is then pre-heated to 60° - 80°C.

The wire is then dipped, at a speed of 3 m/min., in a crucible containing a molten alloy consisting of tin (95%), antimony (4%) and copper (1%) at a temperature of approximately 400°C; the immersion time is approximately 3 seconds.

The wire, on which a layer of alloy is deposited, is then left to cool.

Example 2

Example 1 is repeated using a 0.90 mm wire and dipping it at a speed of approximately 3.3 cm/sec., maintaining the alloy bath at a temperature of approximately 400°C.

Tests performed with wires produced according to the above examples show that the resolution increases considerably since in the audio or video field for example, the parameters linked to it increase: ambience, microcontrast and colour.

The wires according to the invention are suitable for a very wide range of uses, not only as connection cables for low level signals but also for connection cables for power supply, for printed circuit tracks, for coupling, signal, impulse and power transformers, for dipole, array and microstrip antennae, for connectors for signals or power supply and for electromagnetic screens.

In particular the invention refers to a power transformer, for electric distribution network, of analogue, digital and pulse signals and/or a coupling transformer, the windings of which are made of wires as described above.

Preferably the dielectric sheath used for the transformer according to the invention is made of black silk, preferably woven over the wire itself.

In particular, said transformers permit increase of the dynamics in audio signals, reducing the power supply noise; they also permit increase of the microinformation and ambience and change of the timbre in both recording and reproduction systems; said phenomena are also obtained in coupling transformers.

Using the power transformer with video systems, there was an increase in the colour and contrast and a reduction in noise.

Transformers for digital signals produced with wires as described above have provided much better results than those produced with other wire materials in the above parameters.

CLAIMS

1. Electric wire consisting of a metal able to conduct the current, the outer surface of which is covered in a layer of alloy containing tin, antimony and copper.
2. Wire according to claim 1 in which said alloy consists of: tin (74 - 98.9%), antimony (1 - 10%) and copper (0.1 - 10%), said quantities being expressed in weight.
3. Wire according to claim 2 in which said alloy consists of: tin (95%), antimony (4%) and copper (1%), said quantities being expressed in weight.
4. Wire according to claims 1 - 3 in which said wire is a metal wire able to conduct the current.
5. Wire according to claim 5 in which said metal wire is a copper wire.
6. Process for the preparation of a wire according to claims 1 - 5 in which the wire is passed through a flux and left to dry, pre-heated and then dipped in a bath consisting of the molten alloy.
7. Use of a wire according to claims 1 - 5 for the production of connection cables for low level signals, connection cables for power supply, printed circuit tracks and coupling, signal, pulse and power transformers, dipole, array and microstrip antennae, connectors for signals or power supply and for electromagnetic screens.
8. Connection cables for low level signals, connection cables for power supply, printed circuit tracks, coupling, signal, pulse and power transformers, dipole, array and microstrip antennae, connectors for signals or power supply and for electromagnetic screens.
9. Power transformer for electric distribution network, the windings of which are made of a wire according to claims 1 - 5.
10. Transformer according to claim 7 in which the dielectric sheath is made of black silk, woven over the wire itself.

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01B1/02 C23C30/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H01B C23C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, CHEM ABS Data, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 0101, no. 72 (C-354), 18 June 1986 (1986-06-18) & JP 61 023737 A (NIPPON KOGYO KK; others: 01), 1 February 1986 (1986-02-01) abstract	1,4,5
X	US 4 524 241 A (BINDER GERMAINE ET AL) 18 June 1985 (1985-06-18) example 1	5
X	DD 220 915 A (MANSFELD KOM W PIECK FI F NE M) 10 April 1985 (1985-04-10) page 6, line 8 - line 10	1,2,4

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 0103, no. 57 (M-540), 2 December 1986 (1986-12-02) & JP 61 154790 A (TOSHIBA CORP), 14 July 1986 (1986-07-14) abstract	1,2
X	US 3 692 578 A (FIDOS HENRYK ET AL) 19 September 1972 (1972-09-19) the whole document	1,5,6
X	US 4 314 230 A (CARDINAL RAYMOND F ET AL) 2 February 1982 (1982-02-02) column 6, line 43 - line 46	1,5
X	US 6 399 885 B1 (AGOSTINELLI PAOLO) 4 June 2002 (2002-06-04) cited in the application claim 1	8
A	US 5 939 215 A (ANDLER GERD) 17 August 1999 (1999-08-17) claim 2	1-3
A	PATENT ABSTRACTS OF JAPAN vol. 0110, no. 13 (C-397), 14 January 1987 (1987-01-14) & JP 61 190058 A (HITACHI CABLE LTD), 23 August 1986 (1986-08-23) abstract & DATABASE CHEMABS 'Online! CHEMICAL ABSTRACTS SERVICE, COLUMBUS, OHIO, US; 7 March 1987 (1987-03-07), SAITO, KAZUO: "Hot-dip coating of strip or wire" retrieved from STN Database accession no. 1987:71682 abstract & JP 61 190058 A2 (HITACHI CABLE, LTD., JAPAN) 23 August 1986 (1986-08-23)	6
A	EP 0 481 493 A (SUMITOMO ELECTRIC INDUSTRIES) 22 April 1992 (1992-04-22) table 2	1-10

1

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IB 03/06245

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 61023737 A	01-02-1986	JP 1415817 C	10-12-1987
		JP 62020265 B	06-05-1987
US 4524241 A	18-06-1985	FR 2472252 A1	26-06-1981
		DE 3070560 D1	30-05-1985
		EP 0032326 A1	22-07-1981
DD 220915 A	10-04-1985	DD 220915 A1	10-04-1985
JP 61154790 A	14-07-1986	NONE	
US 3692578 A	19-09-1972	DE 1957031 A1	19-05-1971
		AT 300495 B	25-07-1972
		CA 935636 A1	23-10-1973
		CH 570465 A5	15-12-1975
		ES 385491 A1	16-09-1975
		FR 2069304 A5	03-09-1971
		GB 1335053 A	24-10-1973
		SE 359320 B	27-08-1973
		ZA 7007658 A	27-10-1971
US 4314230 A	02-02-1982	CA 1177739 A1	13-11-1984
		EP 0045630 A2	10-02-1982
		GB 2080834 A ,B	10-02-1982
		JP 57060615 A	12-04-1982
US 6399885 B1	04-06-2002	WO 0005731 A1	03-02-2000
		AT 257973 T	15-01-2004
		DE 69821130 D1	19-02-2004
		EP 1019919 A1	19-07-2000
		JP 2002521794 T	16-07-2002
US 5939215 A	17-08-1999	DE 4442186 A1	30-05-1996
		AT 404943 B	25-03-1999
		AT 910295 A	15-08-1998
		AT 175729 T	15-01-1999
		WO 9617100 A1	06-06-1996
		DE 59504837 D1	25-02-1999
		EP 0787218 A1	06-08-1997
		JP 10509770 T	22-09-1998
JP 61190058 A	23-08-1986	NONE	
JP 61190058 A2	23-08-1986	JP 61190058 A	23-08-1986
EP 0481493 A	22-04-1992	JP 5047294 A	26-02-1993
		JP 5006729 A	14-01-1993
		DE 69116976 D1	21-03-1996
		DE 69116976 T2	02-10-1996
		EP 0481493 A2	22-04-1992